



Worksheet 2 Packet switching and routers **Answers**

Task 1

Using the tool www.monitis.com/traceroute you need to investigate how long packets of data take to travel around the Internet.

Simply type in the address of the website you are trying to reach and record the average latency from Europe. You can also see a visualisation of the hops across routers from start to finish.

Continent	URL	Average response time
Europe	www.bbc.co.uk	
Europe		
Africa	www.southafrica.net	
Africa		
Asia	www.tianya.cn	
Asia		
Australasia	www.smh.com.au	
Australasia		
North America	google.com	
North America		
South America	www.brazil.org.za	
South America		

1. Which website has the shortest latency? Likely to be those hosted in Europe if using this worksheet in the UK.
2. Which has the longest latency? Likely to be an Australasian or South American website if using this worksheet in the UK.
3. Why do you think this website has the longest latency? Largest distance from Europe (or rather the longest route)



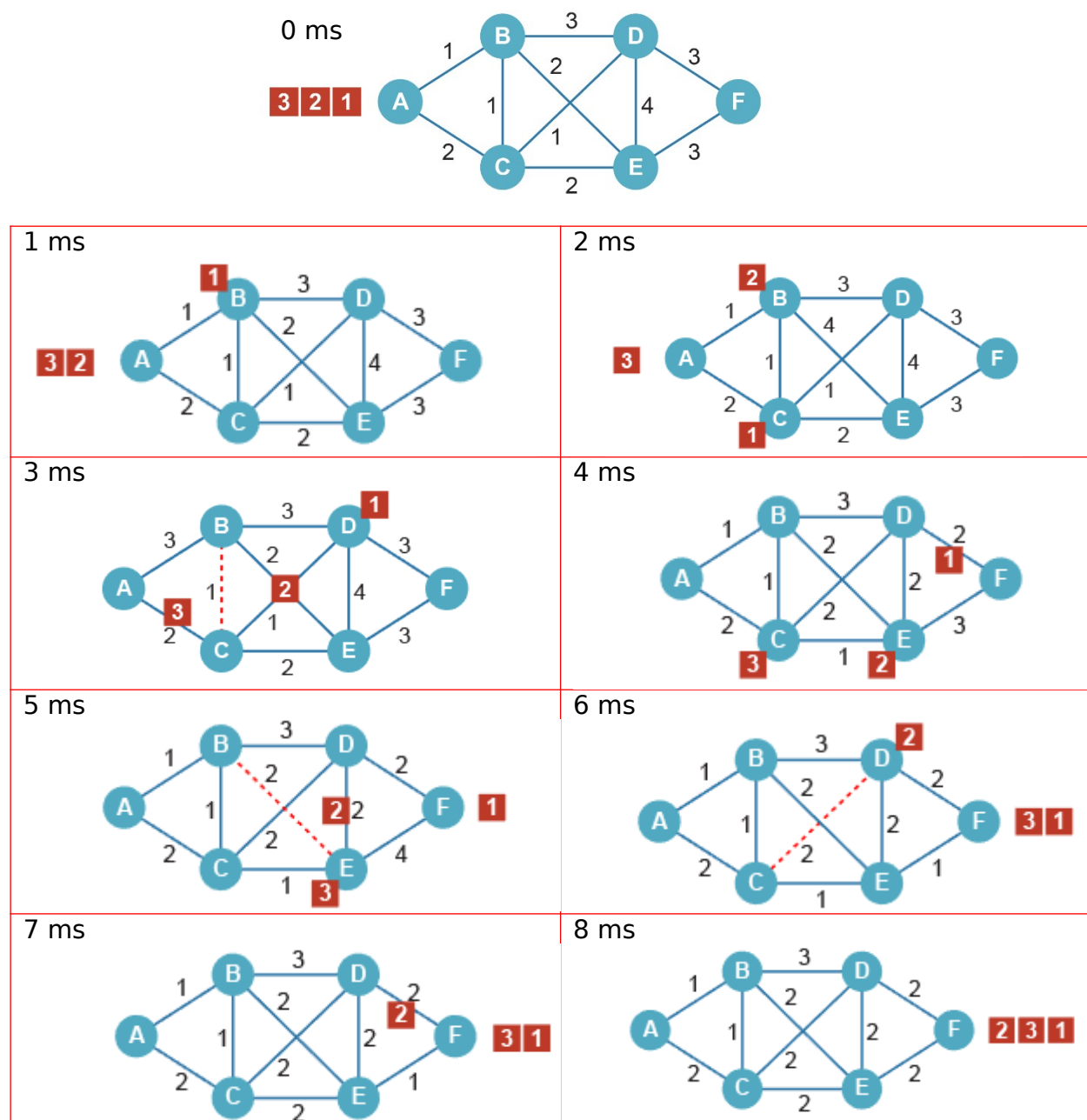
Task 2

The following network shows the latency in milliseconds (ms) between routers in a network. Routers estimate the latencies from the actual progress of packets during the previous millisecond.

Node A is sending data to node F as three packets in the order: 1, 2 and 3, setting off at 1 ms intervals.

On the diagrams below, label where these packets will be after each millisecond if each travels by one of the quickest routes calculated from the estimated latencies. Latencies and available routes vary each millisecond depending on congestion or cable failure (indicated by dotted red line).

At the start, (0 ms elapsed time) packets 1, 2 and 3 are shown in red at A.



In which order will the packets arrive: **1, 3, 2**



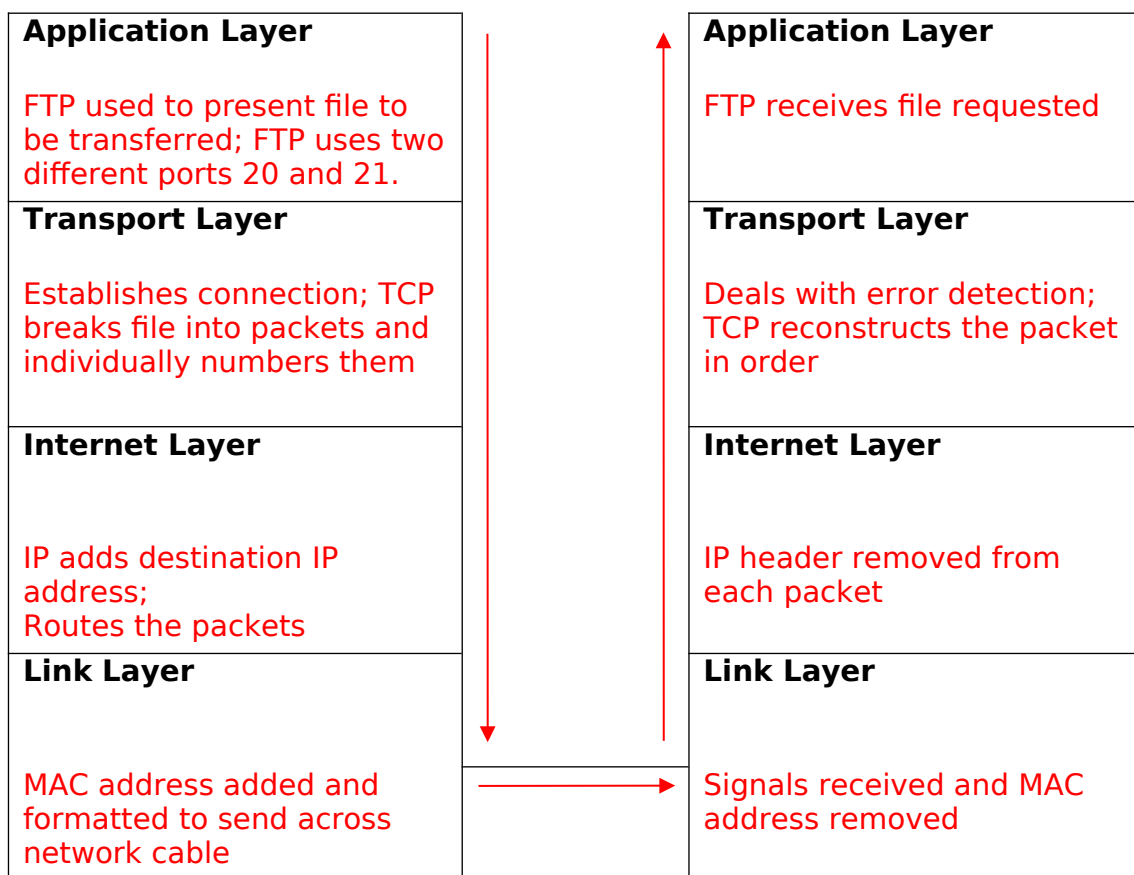
Justify why packet payloads are usually kept to around 1500 bytes. Consider the effects of much larger payloads on transmission time, and the effects of very small payloads on the overheads within the headers and trailers.

- Very small packets on a network would increase the transfer overheads by requiring more headers and trailers. These headers and trailers would significantly increase the overall contribution to the data transferred.
- Single packets containing an entire transmission would hog the transmission routes preventing any further transmission by other routers.
- Smaller packets have less chance of corruption during transmission.

Task 3

A file is being transmitted across an Ethernet network using File Transfer Protocol (FTP) and TCP/IP.

Label the diagram to explain what is happening at each stage of the communication process and add arrows to show the direction of travel.



Explain why TCP and IP are able to work with different application protocols and different network media, (for example HTTP web pages transferred via a fibre optic connection.)

TCP receives data to transfer from layer above and splits it into packets regardless of content.



IP sends addressed packets to the layer below which controls the conversion onto the physical network.

Layers are separate and have no influence on processes above and below, they only act on data they are given and pass to the next layer.

Task 4

Email can be accessed on a server using two different protocols, POP3 and IMAP. Compare the differences between these.

Both allow access to email stored on a server.

POP3 downloads these messages and removes them from the server once completed.

IMAP organises the email on the server but does not download them to the client - only the email header is downloaded to the client device.

POP3 email means that any other device that accesses the same email account will not be able to see the emails once downloaded or viewed on another device.

IMAP holds the emails on the server therefore multiple devices can access the same account and see all the emails.

Because IMAP stores all emails and attachments, storage on the server can be used up quickly.

As POP3 downloads the emails and attachments, the email server will not require much storage capacity.

What role does SMTP play in the delivery of email?

SMTP is required to send an email to the mail server. It is also used in passing emails between email servers in order to reach the final stop, where POP and IMAP are used to retrieve the email messages.